

THE SPECTRAL ENERGY DISTRIBUTION OF THE SCATTERED LIGHT FROM DARK CLOUDS

K. Mattila* and G.F.O. Schnur**

* Helsinki University Observatory,
Tähtitorninmäki, SF-00130 Helsinki, Finland

** Astronomisches Institut der Ruhr-Universität
Bochum, Postfach 102148, D-4630 Bochum, F.R.G.

1. Introduction. A dark cloud is exposed to the ambient radiation field of integrated starlight in the Galaxy. Scattering of starlight by the dust particles gives rise to a diffuse surface brightness of the dark nebula. The intensity and the spectrum of this diffuse radiation can be used to investigate e.g. the scattering parameters of the dust, the optical thickness of the cloud and as a probe of the ambient radiation field at the location of the cloud. An understanding of the scattering process is also a prerequisite for the isolation of broad spectral features due to fluorescence or to any other non-scattering origin of the diffuse light.

2. Observations. We have made photoelectric surface brightness observations of the high galactic latitude dark clouds L1642 ($l = 210^{\circ}8$, $b = -36^{\circ}7$) and L134 ($l = 4^{\circ}0$, $b = 36^{\circ}0$) at five intermediate bands at 3450, 3850, 4150, 4700 and 5500 Å. The ESO 1-m telescope was used for these observations with exactly simultaneous monitoring observations with the ESO 50-cm telescope to eliminate the influence of airglow variations. Because of the high galactic latitude of these clouds it is possible to find dust-free comparison areas in the neighbourhood. Especially in the case of L1642 an analysis of the IRAS surface brightness data by Laureijs, Mattila and Schnur (1987) was used for this purpose.

The spectral energy distributions ($\lambda = 3450-5500$ Å) at ~ 10 positions in L1642 were determined. They cover a range of extinctions from $A_B \sim 0^m.5$ to $\sim 3^m$. The shape of the spectrum changes systematically as a function of A_B : for increasing A_B it becomes increasingly redder. For intermediate extinctions, $A_B \sim 1-1^m.5$, the spectrum is very similar to the spectrum of the incident integrated starlight of the Galaxy.

3. Discussion. We present model calculations for multiple scattering in a spherical cloud. These calculations show that the different spectral shapes of the observed diffuse light can be reproduced

with standard dust parameters. We discuss the possibility to use the observed spectrum also as a diagnostic tool for analysing the optical thickness of the cloud and the dust properties.

Reference

Laureijs, R.J., Mattila, K., Schnur, G.F.O.: 1987, *Astron. Astrophys.*
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